Clinical utility of plasma fructosamine concentration as a hypoglycemic biomarker during early lactation in dairy cattle

ABSTRACT

Background: Plasma fructosamine concentration ([FRA]) is a widely used long term hyperglycemic biomarker in humans and dogs, but its clinical usefulness as a hypoglycemic biomarker in dairy cattle is uncertain.

Objectives: To evaluate the relationship between plasma [FRA] and glucose concentration ([gluc]) as well as indices of energy balance during early lactation in dairy cattle, and to characterize the influence of plasma total protein concentration ([TP]) and albumin concentration ([albumin]) on [FRA].

Animals: Convenience sample comprising 103 periparturient Holstein-Friesian cattle.

Methods: Plasma [gluc], [TP], [albumin], and other clinicopathologic indices of energy status were determined periodically from Day 4 postpartum. Body condition score (BCS) was assessed, and backfat thickness (BFT) and longissimus dorsi muscle thickness (LDT) were measured ultrasonographically. Plasma [FRA] was measured at approximately 28 days postpartum. Associations between plasma [FRA] and study variables were evaluated using Spearman's rho and stepwise forward linear regression. Statistical significance was declared at $P < 0.05$.

Results: A positive association was detected between plasma [FRA] and mean plasma [gluc] from Days 4-28 postpartum ($rs = +0.36$, $P < 0.001$), and between plasma [FRA] and LDT ($rs = +0.28$, $P = 0.007$), BCS ($rs = +0.23$, $P = 0.029$), and BFT ($rs = +0.21$, $P = 0.043$). Multivariable regression identified a positive association between plasma [FRA] and mean plasma [gluc] and [albumin] from Days 4-28 postpartum. Correcting plasma [FRA] for [albumin] improved the association ($rs = +0.46$, $P < 0.001$) between plasma [FRA] and mean plasma [gluc].

Conclusions and clinical importance: Plasma [FRA] does not provide a clinically useful method for quantifying the magnitude of hypoglycemia or negative energy balance in dairy cows during early lactation.

Keyword: Glycated protein; Hyperketonemia; Hypoglycemia